

REMARKS

Claims 1-4, 6-22, 43-45, 47, and 48 will be pending upon entry of the present amendment. Claims 1-3, 6-17, and 43 are amended, and claims 29-42 and 46 are canceled.

Applicant thanks the Examiner for indicating the allowability of the subject matter of claims 9, 14, 16, and 45.

The Examiner has objected to claims 1-3 and 6-17 for various informalities. The claims have been amended to correct the cited informalities, as required by the Examiner. None of the amendments alter the scope of the claims, nor are they made to overcome art for the purpose of patentability. Claim 43 has been amended to correct a typographical error. The scope of claim remains unchanged.

The drawings change that was inadvertently omitted from the previous amendment is included with the present amendment.

The Examiner has rejected claims 1 and 4 under 35 U.S.C. § 102(b) as being anticipated by Opitz et al. Claims 2, 3, 10-12, 15, 47, and 48 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Opitz et al. in view of Randell. Claims 1-4, 7, 8, 10-13, 17, 18, 20, 21, 43, 44, 47, and 48 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Little in view of Randell. Claims 1-4, 6, 8, and 17 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Little in view of Turner. Claim 6 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Opitz in view of Randell and further in view of Turner, while claims 6, 19, and 22 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Little in view of Randell, and further in view of Turner.

In rejecting claim 1 the Examiner states the following, "the recitation of 'configured to direct fluid entering the chamber to impinge against the second surface of the plate' is not considered to be a positive limitation and is functional. See MPEP 2114."

It appears to the applicant that the Examiner failed to give weight to this express feature in claim 1 and instead rejected claim 1 on the grounds that it is a functional limitation that differentiates claim 1 from the prior art. Applicant strongly disagrees with the Examiner's position regarding the meaning of this claim language.

Section 2114 is directed to the question of functional language in patent claims, and includes a citation to *In re Swinehart* (439 F.2d 210, 169 U.S.P.Q. 226, (C.C.P.A. 1970)), to which applicant turns for clarification of the appropriateness of functional language in structural claims.

*In re Swinehart* is an appeals case in which a patent applicant appeals a decision of the Patent Office Board of Appeals affirming rejection of a claim by a patent examiner, to the C.C.P.A. The Board of Appeals states, "claim 24 stands rejected as improperly functional in that it distinguishes over the unsatisfactory material of appellants' Figure 3 merely in the functional term 'transparent to infra red rays.' We agree with the Examiner in this respect . . . ." (Id., at 211)

In reversing the Board of Appeals decision, the majority opinion of the C.C.P.A. states the following, "We take the characterization 'functional', as used by the Patent Office and argued by the parties, to indicate nothing more than the fact that an attempt is being made to define something . . . by what it *does* rather than by what it *is* (as evidenced by specific structure or material, for example). In our view, there is nothing intrinsically wrong with the use of such a technique in drafting patent claims. Indeed we have even recognized in the past the practical *necessity* for the use of functional language." (Id., at 212, emphasis in original.)

The opinion further states, "We are convinced that there is no support, either in the actual holdings of prior cases or in the statute, for the proposition, put forward here, that 'functional' language, in and of itself renders a claim improper. We have also found no prior decision of this or any other court which may be said to hold that there is some other ground for objecting to a claim on the basis of *any* language, 'functional' or otherwise, beyond what is already sanctioned by the provisions of 35 U.S.C. § 112." (Id., at 213, emphasis in original.)

Clearly, the use of functional language, *per se*, has been found acceptable by the courts, and also by the U.S. Patent and Trademark Office, inasmuch as this case has been cited as precedential in the MPEP.

The question remains, then, does the language of claim 1 differentiate the claimed device over the cited prior art. Having concluded that functional language is acceptable, we now turn to claim 1 itself. Claim 1 recites, "a fluid inlet aperture positioned at a central portion of

the of the circular chamber, configured to direct fluid entering the chamber to impinge against the second surface of the plate;...”

Having the central aperture direct fluid into chamber to impinge on the plate is an actual limitation that must not, indeed can not be ignored as if it did not exist. This requires specific structure and is a real limitation.

Claim 1 has been amended to note clearly that the aperture in the central portion is an inlet and the aperture in the peripheral region is an outlet.

Opitz fails to anticipate this limitation, teaching and emphasizing, instead, the advantages of feeding fluid into the flow chamber from the periphery of the device. Opitz states, “According to a preferred embodiment of the invention, the coolant is fed tangentially into the flow chamber by at least one distributor. The coolant is discharged from the flow chamber perpendicularly to the plane of the flow in the center of the vortex through heat insulated central outflow.” (Col. 1, lines 47-52.)

Opitz describes the advantages of this arrangement as follows, “In a vortex sink flow apparatus according to the present invention, the increase of the boundary layer thickness and, therefore the increase of the heat transfer resistance are compensated because of the increase of the flow velocity toward the center of the vortex.” (Col. 2, lines 16-21.)

Opitz reiterates this characterizing feature repeatedly. See, for example, column 2, lines 33-35; column 2, lines 63-64; column 3, lines 1-2; column 3, lines 14-15; and column 3, lines 24-27. Clearly, Opitz does not provide any teaching that would lead one of ordinary skill in the art to provide a fluid inlet aperture in a central portion of a flow chamber, nor is there any motivation provided in Opitz to combine Opitz with any other art offering such a teaching.

Additionally, it would be obvious to one of ordinary skill in the art that a device configured to direct fluid entering the chamber to impinge against the second surface of the plate, as recited in claim 1, would be structurally different from a device configured to feed a coolant tangentially into a flow chamber along a periphery, as taught by Opitz. Accordingly, while the limitation in question is presented in functional language, one of ordinary skill in the art would recognize the structural limits implied.

Clearly, claim 1 is allowable over Opitz et al.

Claim 1 recites, "a plurality of heat conducting fins disposed within the circular chamber."

The Examiner has cited Little in view of Randell as teaching the limitations of claim 1, and also cites Little in view of Turner as teaching the same limitations. In dismissing previous arguments by the applicant with respect to the teachings of Little, the Examiner states the following, "One of ordinary skill in the art would recognize this advantageous modification, since Little requires a low thermal expansion material. Uneven coolant distribution in Little would increase distortion. Thus, the modification taught by Turner would be pertinent in the device of Little."

However, according to Little, "as previously noted, all embodiments of the invention employ the same concept of cooling the central portion of the refrigerator in order to minimize the amount of material being cooled. This creates a large temperature gradient from the center of the refrigerator to its outside edge which remains at least initially at ambient temperatures. This temperature gradient may produce severe stress in the refrigerator plates as the cool central material attempts to contract while the warmer outside areas resist this contraction." (Column 4, lines 4-13.)

Clearly, Little recognizes the effect of the temperature gradient between the center of the refrigerator and its outside edge. Nevertheless, because Little places a high degree of importance on concentrating the cooling effects to the center of the refrigerator, Little rejects the use of highly heat-conductive materials such as heat-conductive fins to more evenly distribute the cooling effects on the surface of the refrigerator, maintaining as a goal the cooling of a very small localized area of the refrigerator (column 1, lines 42-49; column 2, lines 65-68; column 3, lines 28 and 29). Instead, Little employs material having a low degree of thermal conductivity, in order to minimize the amount of energy drawn from other portions of the refrigerator (column 2, lines 21 and 22). Little provides a different solution to the thermal expansion issue, which does not require the use of highly conductive material or the distribution of the cooling effects throughout the device (column 4, lines 20-24).

In rejecting claim 1, the Examiner states, "since Little and Randell are both from the same field of endeavor and/or analogous art, the purpose disclosed by Randell would have

been recognized in the pertinent part of Little. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ in Little radial fin arrays arranged in a spiral pattern for the purpose of minimizing pressure drop as recognized by Randell."

Applicant respectfully traverses this argument on several counts. First, applicant disagrees that Little and Randell are both from the same field of endeavor. Little is directed to a cooling device that employs a refrigerant gas to very quickly achieve temperatures of nearly -300°F in a very small localized portion of the refrigerator (column 3, lines 7-11). Randell, meanwhile, is apparently directed to a device used to warm or heat air as it passes therethrough, as suggested by the existence of electric heat elements mentioned in the English language abstract thereof. While both references deal generally with heat exchange, if the goal is to efficiently heat a volume of gas, as appears to be the case in Randell, a high degree of surface area and mass in the heat exchanger are desirable, and it is important that the heat exchanger itself remain constantly at a high temperature to continually heat the gas. In contrast, Little is directed to achieving a low temperature in the heat exchanger, and thus the ultimate temperature of the gas (that is, after the gas has passed through the device) is irrelevant, while the temperature of the heat exchanger should ideally be very low. Accordingly, Little and Randell are not directed to the same field of endeavor.

Second, Little teaches away from the use of highly conductive surfaces such as the fins taught by Randell, preferring instead materials having low thermal conductivity (column 2, lines 21 and 22), and low mass (column 1, lines 42-45). Applicant does not refute the Examiner's statement that low thermal conductivity does not mean no heat conductivity (page 6, line 12). However, it is nevertheless significant that Little emphasizes the use of material having low thermal conductivity. Applicant submits that it is inappropriate to combine with such a device structures that are configured to be highly thermally conductive, inasmuch as such a combination would be contrary to Little's stated aims, and would tend to reduce the effectiveness of Little's device.

Third, the Examiner suggests that it would be desirable to modify Little's device to include fins for the purpose of minimizing a pressure drop, and that such a desire would be

obvious. However, as is known in the art, according to the Pressure Law, as articulated by Gay Lussac, the pressure of a fixed mass of gas at a constant volume is directly proportional to the absolute temperature. In other words, as the pressure of a gas drops, so also does the temperature thereof. In fact, Little takes full advantage of this principle in an embodiment in which coolant gas is vented directly to the atmosphere for maximum pressure drop, and thus the highest degree of cooling, at a location where the lowest temperature is desired. Little states, "since the pressure of the gas as it leaves the capillary section determines the minimum operating temperature of the refrigerator this embodiment of invention [sic] achieves the lowest possible operating temperature in the region of device."

On the other hand, in a device configured to warm a gas, it would be undesirable to have a sharp pressure drop, as this would result in a sharp drop in the temperature of the gas. Accordingly, it is reasonable for Randell to employ heat conducting fins, both to heat the gas and to control the pressure thereof, but it is not reasonable to employ such fins in a device such as that taught by Little. Accordingly, for at least these reasons, claim 1 is allowable over Little and Randell.

As has been previously demonstrated, Little is directed to a device configured to create a small localized cold spot in the center of the device, while minimizing the conduction of heat to the peripheral areas of the device. In contrast, Turner is directed to a device in which the uniform distribution of the cooling effects are desirable and sought after. For example, with reference to the fins of Turner, Turner states, in column 3, lines 74 and 75, "uniform distribution is further ensured by the radial fins 22 to 27 inclusive." Turner dedicates significant effort at distributing the cooling effects, as witnessed in column 4, lines 11-17, where Turner discusses the use of a deflector cone to reduce heat transfer at the central point of the refrigerator, which "makes for a uniform temperature over the entire tabletop surface *without any localized cold spots.*" (Emphasis added.) This is in direct contrast with Little's aim to create a highly concentrated cold spot in the center of the refrigerator see, for example, Little, column 2, lines 65-68. Accordingly, it is inappropriate to combine the teachings of Little with Turner.

Claim 1 is clearly allowable over Little in combination either with Turner or Randell. Claims 2-17, 47, and 48 are dependent claims from claim 1, and therefore also allowable.

Claim 12 recites the circular chamber having "at least two annular space regions, with at least a first annular space being between the inner array and outer array of fins." The Examiner has cited Figure 5 of Randell as disclosing the inner and outer arrays of fins. However, an examination of Figure 5 reveals that between any two adjacent arrays of fins of Figure 5, the termination points of the outer edges of the inner fins fall on a circle that also includes the termination points of the inner edges of the outer arrays of fins. Applicant calls the Examiner's attention to Figure 8 of the current application. Figure 8 illustrates a circular chamber having an inner array and outer array of fins, 52 and 54, respectively, with an annular space 62 between the arrays. In rejecting claim 12, the Examiner cites Figure 5, specifically guide blade arrays 9 and 10 as being analogous to the inner array of claim 12, and guide blade array 12 as being analogous to the outer array. However, while the guide blade array 10, for example, and 12 do have a spaced-apart relationship, there is no annular space region therebetween, inasmuch as that space is occupied by guide blade array 11. Thus, there is no annular space region between any two of the arrays of fins. Accordingly, claims 12, 13, and 14 are allowable over Randell in combination with Little.

Claim 18 recites, "a fin plate in contact with the heat conducting surface, and having two concentric circular arrays of fins, comprising an inner array and an outer array, each circular array comprising a plurality of fins arranged in a generally radial pattern, extending outward from an inner region of the respective array toward an outer region thereof."

Little fails to teach this limitation, nor can Randell provide this teaching, inasmuch as Little and Randell are directed to incompatible technologies. A combination of the fins of Randell with the refrigerator device of Little would reduce the effectiveness of Little's device. Accordingly, a combination of Randell with Little is inappropriate. Claim 18 is clearly allowable, together with dependent claims 19-22.

Claim 43 recites "a plurality of heat conducting fins disposed within the circular chamber and arranged in at least two concentric circular arrays, comprising at least an inner array

and at least an outer array . . . [and] wherein the circular chamber has two annular space regions, with a first annular space region being between the inner array and outer array of fins."

Little fails to teach these limitations of claim 43. Nor can Randell provide these teachings, inasmuch as Little and Randell are directed to incompatible technologies and cannot, therefore, be reasonably combined. Additionally, Randell fails to teach an annular space between an inner and outer array of fins.

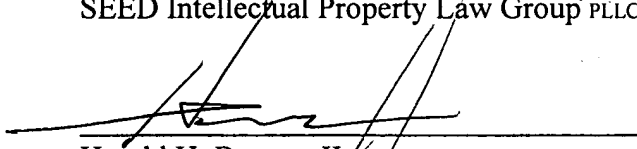
All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited. In the event the Examiner finds minor informalities that can be resolved by telephone conference, the Examiner is urged to contact applicant's undersigned representative at (206) 622-4900 in order to expeditiously resolve prosecution of this application.

The Commissioner is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,

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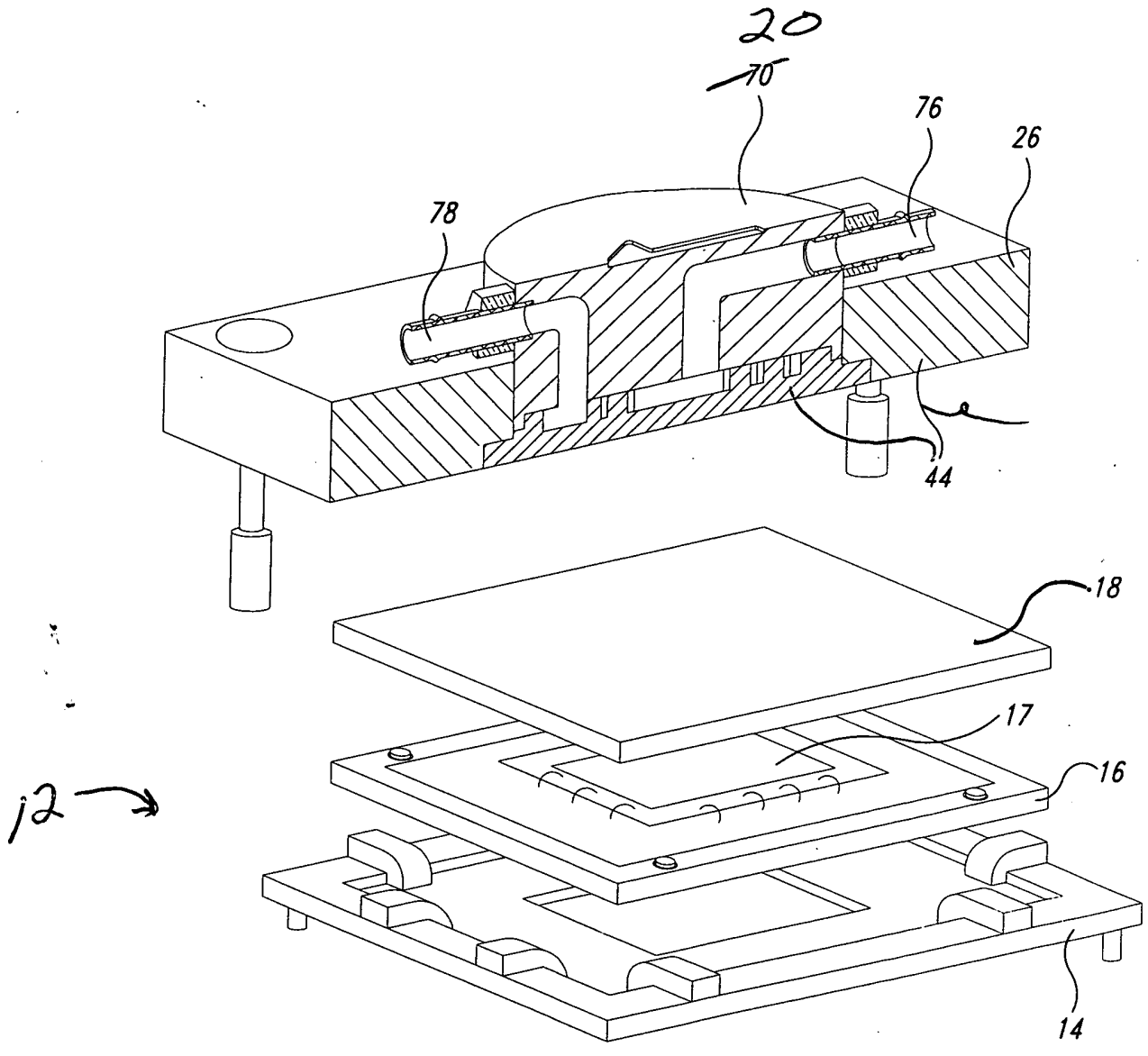


Fig. 2A